tion, about one-half were accompanied by nearly synchronous changes at the base stations; one-third were followed within 48 hours by lower minimum temperatures at the base stations; one-fifth were followed by a slight rise of temperature at the base stations.

In the instances where cold waves on the summit precede those at the base, particularly those where a rise of temperature occurs at the base, the cause is probably local gradients less steep than usual, mechanical cooling of the air at the summit during a strong wind, or clouds or fog in the valleys and below the summit. Such a condition, however, does not appear to be a very stable one and probably can not exist very long.

Abnormal falls of temperature or cold waves occur most frequently when a cyclone or area of low pressure is about 500 miles south or southeast, and an anticyclone or area of high pressure about 300 miles northwest of Mount Rose.

When well-defined cyclones and anticyclones pass over or near Mount Rose, the changes of temperature at the summit and base are nearly synchronous, for at such a time the winds at all levels are higher than normal and the atmosphere more nearly homogeneous.

It is believed that data from high-level stations will be found valuable in local forecasting when studied with reference to the prevailing meteorological conditions, as shown by the daily weather maps. However, since the processes of the free atmosphere are not as yet fully understood, particularly in this region where no systematic aerological exploration has been made, it will be necessary first to determine the vertical gradients or distribution of the chief meteorological elements by means of recording instruments elevated by kites and balloons and from observations of the formation and movements of clouds. This work should be done in some level region, such as the Carson Sink, where the phenomena of the free atmosphere are not influenced by neighboring mountains or valleys. Comparisons of free-atmosphere data with observations on mountains and in valleys under various conditions of weather will show the relation of local phenomena to the general movements of the atmosphere.

Practical use of the results of an investigation of this kind can be made by embodying the information in courses of study, and in publications, so that, in time, the residents of any community familiar with local conditions and having access to the daily weather maps will be able to make local forecasts more accurate than those based upon local or general data alone.

The writer believes that the local weather maps could be improved by the use of data from a larger number of stations and by reducing the data to the average level of the region as well as to sea level, for thereby where changes of pressure are small the effects of errors of reduction will be lessened. Further improvement could be effected by adopting the plan of the International maps wherein the pressures are published in C. G. S. units, so that the pressure at any level is a direct percentage of the entire standard atmosphere near sea level.

The Weather Bureau is rendering an important service in publishing maps, forecasts, and general information for the benefit of agriculture, and this can be made much more effective if our agricultural colleges and stations cooperate with courses of instruction and intensive investigation of problems of local interest.

AEROLOGICAL OBSERVATIONS DURING AIRPLANE FLIGHT ABOVE HAWAIIAN ISLANDS.

[Abstract of report by Lawrence H. Daingerfield, Meteorologist, Weather Bureau, Honolulu, Hawaii.]

This flight was made from Luke Field, Oahu, Hawaii, between 11 and 11:45 a. m., February 25, 1920. Readings of a sling psychrometer were made for each thousand feet during the ascent and descent, and cloud and wind conditions were also noted. Altitudes were those indicated by a standard altimeter, no corrections being applied for mean temperature of the air column.

A light westerly wind prevailed at the surface; this gave way at a low altitude to the northeast trade wind, which in t rn was displaced by a strong west wind (antitrade) at an altitude of about 11,000 to 12,000 feet.

Cumulus clouds were entered at an altitude of 3,000 to 4,000 feet; above these clouds the sky was partially obscured by alto cumulus and a veil of alto stratus from the west.

Psychrometric observations were made by exposing the dry and wet bulb thermometers to the air rushing by the upper left-hand surface of the fuselage. These observations showed decreasing temperatures and relative humidities to the base of the cumulus; a continued temperature decrease and a rise in humidity from that level to the top of the cumulus; a temperature inversion and very low humidity during the next 2,000 feet; and decreasing temperatures, accompanied by increasing humidities, from about 8,000 feet to the highest altitude reached.

So far as known, these are the first free-air meteorological observations ever made above the Hawaiian Islands.— *W. R. G.*

ALTITUDE DETERMINATIONS BASED ON BAROMETRIC READINGS.

By H. G. CORNTHWAITE, Acting Chief Hydrographer.

[Balboa Heights, Canal Zone, Mar. 16, 1920.]

Under favorable conditions very accurate altitude determinations can be made from simultaneous barometric readings, especially in the Tropics where air-pressure fluctuations are small.

Up to elevations of 5,000 or 6,000 feet a mercurial barometer is preferable to an aneroid for this work if closely accurate results are desired; at higher levels it will probably be necessary to use an aneroid, which should give satisfactory results if the instrument used is a good one, but it should first be carefully tested covering the expected range in pressure readings. Few aneroids can be depended upon to give as accurate readings over a wide range in pressure as a good mecurial barometer. The aneroid may read accurately at sea level, but be off several hundredths of an inch at an elevation of 5,000 feet. When it is recalled that an error of 1/100 inch is equivalent to about 10 feet difference in altitude, it will be seen that an error of a few hundredths inch in the aneroid reading may mean a considerable error in the altitude determination.

A "Mountain" mercurial barometer equipped with carrying case and tripod is a convenient instrument to use for topographic reconnaissance work at moderate elevations, and it will give better results than most aneroids (see plate No. 1).